

A short survey of aphids at Knepp Estate

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MAY 2014

Introduction

Knepp Castle Estate used to be traditional arable and dairy farm. However, for the past 12 years the land has been managed to boost biodiversity and allow less intensive meat production. Boundaries between fields have been removed, and the 1400 hectares are now grazed by free roaming herds of Longhorn cattle, Exmoor ponies, Tamworth pigs and Fallow deer. This has resulted in an interesting mixture of long established woodland patches, grazing land and arable land, with various areas going over to shrubs. Of concern parts of the southern block are now densely covered in 'weeds' that are not palatable to livestock, in particular fleabane (*Pulicaria dysenterica*).

Aphids provide an excellent indicator of biodiversity, partly because there are a huge number of species present in Britain - over 600 at the last count. Many aphid species have a very restricted host range, and to some extent aphid species richness will mirror plant species richness. Some individual plant species such as oak host a large number of aphid species. The presence of some of those species will often depend on how old the woodland is, and whether other organisms are present - in particular the ant species that tend aphids for their honeydew.

This report describes the aphid finds during a short survey conducted during the Sussex Biological Recorders weekend visit (May 24-26 2014) to the "re-wilding" Knepp Castle Estate project in their Southern Block, and to the Castle, near Dial Post by the A24 north of Worthing.

To maximise the information gained on associations with other organisms, aphid samples were obtained hand-searching.

Results

We found a total of 23 aphid species.

Aphid species list

- *Aphis chloris* (St John's wort aphid),
- *Aphis fabae fabae* (Black bean aphid),
- *Aphis rumicis* (Dock aphid),

- *Aphis urticata* (Dark green nettle aphid),
- *Betulaphis quadrituberculatus* (Small downy birch aphid),
- *Brachycaudus cardui* (Plum-thistle aphid),
- *Brachycaudus helichrysi* (Leaf-curling plum aphid),
- *Brevicoryne brassicae* (Mealy cabbage aphid),
- *Chaitophorus caprea* (Pale sallow leaf aphid),
- *Cinara pinea* (Large pine aphid),
- *Corylobium avellanae* (Large hazel aphid),
- *Eriosoma ulmi* (Elm-currant aphid),
- *Macrosiphum rosae* (Common rose aphid),
- *Microlophium carnosum* (Common nettle aphid),
- *Myzocallis carpini* (Hornbeam aphid),
- *Myzocallis castanicola* (Sweet chestnut aphid),
- *Myzus cerasi* (Black cherry aphid),
- *Ovatus crataegarius* (Hawthorn-mint aphid),
- *Periphyllus testudinaceus* (Common periphyllus aphid),
- *Pineus pini* (Pine adelgid),
- *Pterocallis alni* (Common alder aphid),
- *Tetraneura ulmi* (Elm-grass root aphid),
- *Tuberculatus annulatus* (Common oak aphid).

Below we briefly describe the woodland species, followed by the shrub and herb fauna.

***Quercus robur* (Oak)**

English oak (*Quercus robur*) has over 30 aphid species. A special effort was made to check very old oak trees at Knepp in the hope of finding some of the real rarities of the aphid world such as *Stomaphis quercus*. Sadly it was probably too early in the year to stand much chance of finding that species, but we did find two of the commoner ones.

- ***Myzocallis castanicola*** (Sweet chestnut aphid)

Sweet chestnut aphids are found on both English oak (*Quercus robur*) and sweet chestnut (*Castanea sativa*). All adults are winged. Winged adults are yellow and distinctively marked with a dark median strip on the head and thorax, and paired black spinal and marginal patches on the dorsal abdomen.



Figure 1. Alate of *Myzocallis castanicola* on oak at Knepp.

We only found this species once at Knepp on *Quercus* on 25/5/14, but it is probably widespread.

- ***Tuberculatus annulatus*** (Common oak aphid) The common oak aphid is found on the undersides of leaves of oak (*Quercus* spp.), especially English oak (*Quercus robur*) and, less commonly, sessile oak (*Quercus petraea*). All adults are winged. They vary in colour from yellowish, greyish-green or pink to purple in summer. The siphunculi of adults are dark on the distal third or more.



Figure 2. Fourth instar nymph of *Tuberculatus annulatus* on oak at Knepp.

This species was common at Knepp on several *Quercus* trees on 24/5/14.

None of the ant-attended oak aphids was found, possibly reflecting a shortage of suitable ant species such as *Lasius fuliginosus*.

***Betula pubescens*, *Betula pendula* (Birch)**

- ***Betulaphis quadrituberculatus*** (Small downy birch aphid).



Figure 3. Colony of *Betulaphis_quadrituberculatus* on downy birch at Knepp.

The wingless aphids are pale yellowish green to pale yellow to almost white, although in late summer to autumn they may have patches of darker pigment. The siphunculi are smooth and short. They are mainly found on the undersides of leaves of downy birch (*Betula pubescens*), but they also occur on silver birch (*Betula pendula*) and occasionally on grey alder (*Alnus incarna*).

A few colonies were found at Knepp on the underside of *Betula pubescens* leaves on 25/5/14.

***Carpinus betulus* (Hornbeam)**

- ***Myzocallis carpini*** (Hornbeam aphid)

Myzocallis carpini feeds on the undersides of leaves of hornbeam. Winged adults are pale yellow to yellowish white, with no dorsal abdominal markings. The antennae are ringed with black, and the forewing has a black spot at the base of the pterostigma.



Figure 4.A. Winged adult of *Myzocallis carpini* on hornbeam at Knepp. B. Fourth instar alateform *Myzocallis carpini* nymphs on hornbeam at Knepp.

The species is generally rather infrequent, but can become abundant when hornbeam is used for hedging.

A few colonies were found at Knepp on *Carpinus betulus* leaves on 25/5/14.

***Ulmus procera* and *Ulmus glabra* (Elms)**

- ***Tetraneura ulmi*** (Elm-grass root aphid)

The aphids develop within galls on elm (shown in Fig. 5. below). The galls are stalked, approximately bean-shaped, smooth and shiny, and coloured reddish-green and/or yellow.



Figure 5. *Tetraneura ulmi* gall on elm at Knepp.

The aphid that creates the gall is light green with the head, thorax, antennae and legs dark and no wax glands. The offspring have a shiny black head, thorax, antennae and legs, greyish black abdominal segments and wax glands.



Figure 6.A. *Tetraneura ulmi* colony in gall on elm at Knepp. B. *Tetraneura ulmi* colony in gall on elm at Knepp. Fundatrix with old nymphs.

A few galls were recorded at Knepp on 23 & 24/5/14 on regrowing elm trees along field boundaries.

- ***Eriosoma ulmi*** (Elm-currant aphid)

The elm-currant aphid host alternates from the primary host elm (*Ulmus* spp.) to the secondary host currant (*Ribes*). The aphids that hatch from the overwintering eggs develop in yellowish or whitish green galls on elm. These galls are formed by downward curling, twisting and blistering of one edge of a

leaf. Along with their wingless offspring they are dark green and wax-covered. Their offspring are brownish or dull green and develop to adult winged aphids which are dark green to bluish grey with dark cross bands on the abdomen.



Figure 7. Winged *Eriosoma ulmi* adult on elm at Knepp.

Unlike *Tetraneura ulmi*, the gall is not sealed and predators can enter. Fig. 8. shows a larva of *Syrphus ribesii* inside the gall.



Figure 8. Predatory syrphid larva (*Syrphus ribesii*) in gall of *Eriosoma ulmi* on elm at Knepp.

This was recorded once at Knepp on elm in woodland beside campsite on 25/5/14.

Alder (*Alnus glutinosa*)

- ***Pterocallis alni*** (Common alder aphid)

This species is found almost exclusively on common alder (*Alnus glutinosa*). Both the winged and wingless adults are yellowish white to yellowish green.



Figure 9. Wingless adult of *Pterocallis alni* on alder at Knepp.

This was recorded once at Knepp on alder on 24/5/14.

***Salix cinerea* and *Salix caprea* (Sallows)**

- ***Chaitophorus caprea*** (Pale sallow leaf aphid)

The pale sallow leaf aphid lives mostly on sallows (broad-leaved *Salix* spp.) especially great sallow (*Salix caprea*) and grey sallow (*Salix cinerea*). The aphids are white to yellowish-white. There are no distinct dark dorsal abdominal markings. These aphids are not attended by ants.



Figure 10. Adult & nymph of *Chaitophorus caprea* on sallow at Knepp.

A few were found at Knepp scattered on the undersides of sallow leaves on 24/5/14

***Acer campestre* (Field Maple)**

- ***Periphyllus testudinaceus*** (Common periphyllus aphid)

The common periphyllus aphid feeds on wide range of *Acer* species. They are dirty dark green to dark brown aphids with a clear pattern of dark abdominal sclerites. Winged forms have dark dorsal abdominal cross-bands and marginal sclerites, which are darker than the light brown pterostigma of the wing.



Figure 11. *Periphyllus testudinaceus* winged adult and nymph on field maple at Knepp.

This species was common and widespread at Knepp from 23-25/5/14 on field maple (*Acer campestre*).

***Corylus avellanae* (Hazel)**

- ***Corylobium avellanae*** (Large hazel aphid)

The large hazel aphid spends its entire life cycle on hazel and is not attended by ants. It feeds on the fast growing shoots and is generally rather uncommon. Aphids are yellowish-green often mottled with red spots. The siphunculi are long, thin and tapering.



Figure 12. Nymphs of *Corylobium avellanae* on young growth of hazel at Knepp.

A small colony was found at Knepp on the young shoots of hazel (*Corylus avellanae*) on 25/5/14.

***Pinus sylvestris* (Scots Pine)**

- ***Cinara pinea*** (Large pine aphid)

The large pine aphid feeds on Scots Pine (*Pinus sylvestris*). Adults are shiny orange-brown early in the year and grey or dark brown later on. The body is finely spotted with black and dusted with wax. The siphuncular cones are small to medium sized and reddish-brown or dark brown. The large pine aphid is unusually large for an aphid at up to 5 mm in length. They are usually attended by ants.





Figure 13.A. Adult of *Cinara pinea* on Scots Pine at Knepp. B. Second instar nymph of *Cinara pinea* on Scots Pine at Knepp. C. Fourth instar alatform nymph of *Cinara pinea* on Scots Pine at Knepp.

Several colonies of the large pine aphid were found on Scots Pine at Knepp on 25/5/14.

- ***Pineus pini*** (Pine adelgid)

Some pine trees had the adelgid *Pineus pini* on them (not photographed).

***Prunus avium* (Wild cherry)**

- ***Myzus cerasi*** (Black cherry aphid)

The black cherry aphid alternates between cherry (*Prunus cerasus*, *Prunus avium*) as the primary host and bedstraws (*Galium*), eyebrights (*Euphrasia*) and speedwell (*Veronica*) as secondary hosts. The wingless adults on cherry are shiny, very dark brown to black with a sclerotized dorsum. Their siphunculi are cylindrical and black with the distal part slightly curved outward.



Figure 14. *Lasius* ant tending *Myzus cerasi* on cherry at Knepp.

Colonies were found at Knepp around the camp site and elsewhere on 23/5/14 on cherry. They were attended by ants (*Lasius* sp.).

***Prunus spinosa* (Blackthorn)**

- ***Brachycaudus helichrysi*** (Leaf-curling plum aphid)

The leaf-curling plum aphid alternates between various plum (*Prunus*) species (especially domestic plum and blackthorn) and a wide range of Asteraceae such as asters, chrysanthemums, yarrow and groundsel. On the primary host it lives in a gall of curled leaves. These aphids are variable in colour ranging from yellow to green to brown. Their siphunculi are pale, tapered and short.



Figure 15.A. *Brachycaudus helichrysi* galls on *Prunus spinosa* at Knepp. B. *Brachycaudus helichrysi* in galls on blackthorn at Knepp.

This was widespread at Knepp on blackthorn (*Prunus spinosa*) from 23-25/5/14.

***Rumex* (Dock)**

- ***Aphis rumicis*** (Dock aphid)

The dock aphid feeds only on dock (*Rumex* species). It is probably fairly common in Britain, but many older localities records are unreliable because

the species has often been confused with *Aphis fabae*. Unlike that species, the immatures of *Aphis rumicis* do not have the white pleural wax spots typical of *Aphis fabae*. Also unlike *Aphis fabae*, *Aphis rumicis* rolls and crumples the leaves of its host before later in the year moving up stems and into the inflorescences. *Aphis rumicis* is usually attended by ants.



Figure 16. *Aphis rumicis* colony on dock at Knepp.

The dock aphid was widespread at Knepp on dock (*Rumex*) from 23-25/5/14 in pasture.

***Urtica dioica* (Stinging nettle)**

There are two stinging nettle aphids and both feed exclusively on stinging nettle.

- ***Microlophium carnosum*** (Common nettle aphid)

These are large spindle-shaped aphids, the adults of which may be winged or wingless. The antennae are much longer than the body length and the siphunculi are long, tapering with a large flange. They are not ant attended.



Figure 17. *Microlophium carnosum* wingless adult found on nettle at Knepp.

The common nettle aphid was common and widespread at Knepp on *Rumex* from 23-25/5/14 in pasture.

- ***Aphis urticata*** (Dark green nettle aphid)

These are medium sized aphids which are usually attended by ants. Early generations are dark bluish-green with yellowish cauda and siphunculi. Later generations are yellow and much smaller. Two of the aphids in Fig. 18.B. belong to the smaller yellow form.



Figure 18.A. Wingless adult of *Aphis urticata* on nettle at Knepp. B. Colony of *Aphis urticata* being tended by *Lasius* ant on nettle at Knepp.

The dark green nettle aphid was found in one site at Knepp on 25/5/14. They were attended by ants (*Lasius* sp.).

***Senecio jacobaea* (Ragwort)**

- ***Brachycaudus cardui*** (Plum-thistle aphid)

The primary hosts of the plum-thistle aphid are various *Prunus* species, mainly cherry, plum and apricot. Aphids migrate to various wild and cultivated

daisies especially thistle (*Carduus* and *Cirsium* spp.) and ragwort (*Senecio*). The wingless adults are brownish-yellow, pale green or brown, with a large black spot situated dorsally on the abdomen. The siphunculi are black, thick and cylindrical. Immatures often have reddish patches on a greenish background. *Brachycaudus cardui* are usually ant attended.



Figure 19.A. *Brachycaudus cardui* colony on ragwort at Knepp. B. *Brachycaudus cardui* with predatory seven-spot ladybird at Knepp.

This was widespread at Knepp on *Senecio* from 23-25/5/14 in pasture.

The interaction between ragwort, aphids, ants and grazers is a complex and dynamic balance. Ragwort produces toxins to repel herbivores - including grazers such as cattle. However plants infested with aphids - and most

particularly with their attendant ants - also deter herbivores. In addition *Brachycaudus cardui* prefer ragwort with comparatively low amounts of toxin. Producing toxins, or supporting aphids, are metabolic costs to the ragwort plants. The end-result of which is, in the presence of grazers, aphids, and ants, relatively non-toxic ragwort strains tend to be at an advantage.

***Rosa caninum* (Dog Rose)**

- ***Macrosiphum rosae*** (Common rose aphid)

The rose aphid may alternate from the primary host rose to the secondary hosts, teasels and valerians - or it may remain on rose all year round. The wingless or winged adults are green (see Figure 20.A.) or red (Figure 20.B, C.). The siphunculi are black and bent outwards.





Figure 20.A. Green form of *Macrosiphum rosae* adult and nymph on dog rose at Knepp. B. Red form of *Macrosiphum rosae* winged adult on dog rose at Knepp. C. Red form of *Macrosiphum rosae* nymph on dog rose at Knepp.

This was widespread at Knepp on *Rosa caninum* from 23-25/5/14 in scrub.

***Hypericum calycinum* (Rose of Sharon)**

- ***Aphis chloris*** (St John's wort aphid)

St John's wort aphid is rather bright green, pale yellow-green or dark green. It has dark siphunculi but a rather pale cauda. There are taxonomic problems

surrounding this aphid in that it is unclear whether it is actually *Aphis chloris* (formerly thought to only occur on *Hypericum perforatum*) or a new undescribed species.



Figure 21.A. Colony of *Aphis chloris* on *Hypericum calycinum* at Knepp. B. Colony of *Aphis chloris* attended by *Lasius* ant on *Hypericum calycinum* at Knepp.

Several colonies were found at Knepp on *Hypericum calycinum* on 23/5/14. They were attended by ants (*Lasius* sp.).

***Chenopodium album* (Fat hen)**

- ***Aphis fabae fabae*** (Black bean aphid)

The black bean aphid host alternates between spindle (*Euonymus europaeus*) and several secondary hosts including broad beans (*Vicia faba*), poppies (*Papaver* spp.) and *Chenopodium* spp.



Figure 22.A. Gall of *Aphis fabae* on *Chenopodium* at Knepp. B. *Aphis fabae* with nymphs on *Chenopodium* at Knepp.

A colony was found at Knepp on the camp site galling the leaf of *Chenopodium album*. This colony is somewhat aberrant in that the leaf is folded round as a gall (shown in the Fig. 22.A.) and the immatures do not have white pleural wax spots (shown in Fig. 22.B.).

***Mentha* sp. (Mint)**

- ***Ovatus crataegarius*** (Hawthorn-mint aphid)

The hawthorn-mint aphid alternates from hawthorn and apple (Rosaceae) to mint (*Mentha*). The wingless adults are yellow-green to apple-green, sometimes mottled with darker green markings. Their antennae are curved and somewhat longer than the length of the body.



Figure 23. *Ovatus crataegarius* adult on mint at Knepp.

Aphids were found at Knepp on mint in the kitchen tent. The mint was apparently picked locally in the garden.

***Brassica* (Brassica)**

- ***Brevicoryne brassicae*** (Mealy cabbage aphid)

The mealy cabbage aphid spends its entire life cycle on cabbage (*Brassica* sp.). The adults are green and wax-powdered. Their siphunculi are thick and very short.



Figure 24.A. Colony of *Brevicoryne brassicae* on *Brassica* at Knepp. B. Colony of *Brevicoryne brassicae* with parasitoid *Diaretiella rapae* on *Brassica* at Knepp.

Several colonies were found at Knepp on *Brassica* in the garden. They were parasitized (see Fig. 24.B.) by the specialized Braconid wasp, *Diaretiella rapae*.

Discussion

Due to the number of old hedgerows, there were a good diversity of hedgerow shrubs and trees - and a corresponding diversity of aphids feeding upon those

species. This is important because modern farming practices (such as herbicide use and hard mechanical trimming) tend to impoverish hedgerows.

Given the tree species present, which included oak, birch and elm, we would have expected more aphid species than we found. This may be, in-part, because this survey was performed in May. Many species such as *Lachnus roboris* on oak build up slowly in numbers through the year, and the very low numbers present in May are unlikely to be detected by hand searching. But a more important factor constraining aphid biodiversity is probably the lack of mutualist ant species, especially wood ants (*Formica* spp.). Much of the area was too wet for wood ants, but we would expect to find jet black ants (*Lasius fuliginosus*). We did not find any aphid species being attended by this ant, although these ants have been found on the Knepp Estate (nesting in an old tree) by the Knepp Castle Estate baseline ecological survey.

The number of aphid species on herbs was very low - partly because in May host-alternating aphids would still have been on their primary (woody) hosts - but more importantly because of the comparatively low herb diversity. This is presumably due to prolonged (conventional) cattle grazing - and associated farming practices such as fertilizers and herbicides. One way to remedy this would be to exclude cattle from some areas, or to graze the areas briefly but intensively. An additional factor is the excessive number of rabbits, possibly due to predator control to promote game-bird populations.

No aphids were found on fleabane (*Pulicaria*) although a number of aphid species do feed on it. In particular *Ovatus inulae*, alternates from hawthorn and apple (Rosaceae) to fleabane. Whether this aphid has any control potential for fleabane is unknown.

Acknowledgements

We wish to thank everyone at Knepp Wildland Safaris for assistance during this survey, and inviting the Sussex biological recorders to their Safari Camp opening weekend. We also thank Penny Green, BRC Manager, Sussex Biological Records Center for helping arrange this recording event.